

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**B.Sc. DEGREE EXAMINATION – PHYSICS****SECOND SEMESTER – APRIL 2023****16/17/18UPH2MC01 – MECHANICS**

Date: 10-05-2023

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART – A**(10 x 2 = 20 Marks)**

Q. No.	Answer ALL questions
1	What is a field?
2	State Newton's first law of motion.
3	Define gravitational potential.
4	State the law of conservation of energy.
5	Define torque.
6	State the perpendicular axes theorem in moment of inertia.
7	How do you produce simple harmonic motion?
8	What is the dimension of damping coefficient?
9	Define the term 'frame of reference'
10	What are the postulates of special theory of relativity?

PART – B**(4 x 7.5 = 30 Marks)****Answer any FOUR questions**

11	Discuss the problem of Atwood's machine and obtain the expressions for acceleration of the masses and the tension in the string.
12	Discuss about the force of friction and explain how to determine the coefficient of static friction between two surfaces using inclined plane.
13	Determine the moment of inertia of a plane lamina of length l , breadth b and mass m about an axis passing through its center and perpendicular to its plane.
14	Set up and solve the equation of motion of a compound pendulum and determine its period of oscillation.
15	What is meant by relativistic length contraction and time dilation?
16	Define velocity of escape and deduce the formula to calculate it.

PART – C**(4 x 12.5 = 50 Marks)****Answer any FOUR questions**

17	Discuss the motion of a charged particle in a crossed electric & magnetic field. From this, obtain the principle of a velocity selector.
18	<p>a) Set up and solve the equation of motion of a particle of mass m projected from point (x_0, y_0) with an initial velocity v_0 at an angle θ to the horizontal.</p> <p>b) Calculate the coordinates of a particle projected from the origin with an initial velocity of 25 m/s at an angle 45° to the horizontal. Determine the maximum height attained by the particle and its range. (9+3.5)</p>

19	Discuss the problem of the scattering of a proton by a heavy nucleus applying conservation of angular momentum. From this indicate how the distance of closest approach can be measured.
20	a) Consider a cylinder of mass M and radius R rolling down an inclined plane making an angle θ with the horizontal, without slipping. Calculate the acceleration of its center of mass. (7.5) b) Set up and solve the equation of motion of an LC circuit with inductance L and capacitance C . (5)
21	Obtain Lorentz transformation equations. What are their inverse transformations?
22	Describe Michelson-Morley experiment and discuss the implications of the negative result.

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